NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

ANIONIC POLYACRYLAMIDE (PAM) EROSION CONTROL (ACRE)

CODE 450

DEFINITION

Erosion control through application of water-soluble anionic polyacrylamide (PAM).

PURPOSE

This practice is applied as part of a conservation management system to support one or more of the following:

- Minimize or control irrigation-induced soil erosion.
- Reduce wind and/or precipitation erosion.

CONDITIONS WHERE PRACTICE APPLIES

- On irrigated lands susceptible to irrigation-induced erosion, excluding peat soils, and where the sodium adsorption ratio (SAR) of irrigation water is less than 15;
- On areas where the timely establishment of vegetation may not be feasible or where vegetative cover is absent or inadequate;
- On areas where plant residues are inadequate to protect the soil surface from wind erosion; and
- On sites where disturbance activities prevent establishment or maintenance of a cover crop.

This standard does not apply to the application of polyacrylamides to flowing, non-irrigation, waters.

CRITERIA

General Criteria Applicable To All Purposes

Changes in management shall be implemented where increases in soil infiltration rates are a result of implementing this practice.

The polyacrylamide (PAM) shall:

- **be used only if officially labeled for the intended use (e.g. labeled for irrigation erosion control or wind erosion control).**
- be of the anionic type meeting acrylamide monomer limits of ≤0.05 percent (%),
- have a charge density of 10 to 55 percent, by weight,
- have a molecular weight of 6 to 24 Mg/mole.
- **be designated as "water soluble," "linear," or "non-crosslinked."**
- be mixed and/or applied in accordance with all Occupational Safety and Health Administration (OSHA) Material Safety Data Sheet requirements and the manufacturer's recommendations for the specified use.
- conform to all federal, state, and local laws, rules, and regulations.

Additional Criteria Applicable To Irrigation Induced Soil Erosion

Surface Irrigation

PAM shall be used during the first irrigation and after any soil disturbance (pre-irrigation is considered irrigation) and during later irrigations if soil movement is observed.

NRCS, MT
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Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard contact the Natural Resources Conservation Service.

NOTE: This type of font **(AaBbCcDdEe 123..)** indicates NRCS National Standards.
This type of font (AaBbCcDdEe 123..) indicates Montana Supplement.

Mixed concentrations of PAM shall be added to irrigation water only during the advance phase of a surface irrigation. The advance phase shall be considered the time irrigation starts until water has advanced to the end of the field. **In some cases PAM may be shut off prior to completion of the advance phase so long as no visible erosion occurs.**

The resulting concentration of PAM in irrigation water shall not exceed 10 ppm of pure form polyacrylamide, applied on a total product basis.

Dry or "patch" treatments of PAM shall be placed over an area of the first five (5) feet of furrow. **A starting application rate of 1 ounce per 1,000 feet of furrow length is recommended. Field adjustment (increase or decrease) to this application rate is required. The rate should be adjusted until no visible erosion occurs.**

Sprinkler Irrigation

The maximum application rate of Polyacrylamide active ingredient shall not exceed four (4) pounds per acre (lb./ac) per single application event.

PAM mixtures will be totally mixed and liquefied prior to injection into the irrigation system.

Injection shall occur on the downstream side of all screens and/or filters and conform to all federal and state chemigation standards.

Additional Criteria Applicable To Reduce Wind and/or Precipitation Erosion

The maximum application rate of pure form polyacrylamide shall not exceed 200 lb./ac per year.

Emulsion batches shall be mixed with pure form polyacrylamide not exceeding 200 pounds per batch.

Application method shall insure uniform coverage to the target area, minimizing drift to non-target areas.

CONSIDERATIONS

The following relate to the application of the polyacrylamide practice that may enhance, or avoid problems with the practice but are not required to insure its basic conservation function.

General

PAM application rates may need to be adjusted based on soil properties, slope, and type of erosion targeted.

Where reasonably possible, tailwater or runoff containing PAM should be stored for re-use or recycled on other land areas.

Use of polyacrylamide in combination with other conservation and Best Management Practices will improve erosion control.

Irrigation Induced Erosion Considerations

Other conservation treatments such as land leveling, irrigation water management, reduced tillage, reservoir tillage, crop rotations, etc. should be used in conjunction with this practice to control irrigation-induced erosion.

PAM may result in an increase in surface irrigation infiltration of up to 60 percent, with 15 percent being typical on medium textured soils.

To compensate for PAM changes in infiltration, adjustments in flow rates, time of set, and tillage practices should be considered.

Consideration should be given to increasing furrow stream size in order to compensate for increased infiltration. Stream size should be monitored to insure there is no visible sign of erosion. If stream sizes are increased, cutback irrigation (reducing the stream size after advance is completed) should be considered to reduce runoff and maintain high irrigation efficiency, unless an irrigation reuse system is in place.

Adjustment from maximum PAM rates and volumes should be considered so long as no visible erosion occurs.

If irrigation water is high in sediment, application of PAM to the head ditch or lateral may cause excessive sedimentation within the ditch/lateral and loss of flow capacity. Consideration should be given to settling out the sediment in a settling pond with increased PAM application rates or by decreasing flocculation potential by applying smaller application rates (e.g., 5 ppm) while still controlling erosion.

Secondary applications on undisturbed soil may be needed in surface irrigation when sediment or erosion is noted.

Sprinkler systems will likely need multiple applications to achieve a significant erosion reduction.

For **pressurized** and **gated pipe systems**, before

and after injecting concentrated liquid PAM (30 to 50 percent active ingredient) into sprinkler **or gated pipe** irrigation systems, it is a good practice to pump a surfactant (crop oil) through the injection system (pump, tubing, valves, etc.). Surfactants provide a buffer between PAM and water so non-flowing PAM does not contact water and form a gelatinous mass that can plug valves and tubing.

For **pressurized** sprinkler and **gated pipe** injection, the injection pump should be started after water is flowing in the sprinkler system **and/or gated pipe system** and stopped when the irrigation pump stops.

For PAM injection systems, a check valve should be installed between the irrigation supply line and the injection system to prevent water from entering the injection system and/or PAM supply container.

Applications at the end of the season are discouraged, unless the field has been recently tilled.

Wind or Precipitation Erosion Considerations

Adding seed to polyacrylamide mixture may provide additional erosion protection beyond the life of the PAM material.

PAM may improve water quality, infiltration, soil fertility, and air quality.

Safety and Health

Use proper personal protective equipment, e.g. gloves, masks, and other health and safety precautions in accordance with the label, industry, and other federal or state rules and guidelines.

If inhaled in large quantities, PAM dust can cause choking and difficulty in breathing. Persons handling and mixing PAM shall use a dust mask of a type recommended by the manufacturer.

PAM solutions can cause surfaces, tools, etc. to become very slippery **or** when **dry residues are wetted**.

Clean liquid PAM spills with dry absorbent material (sawdust, soil, cat litter, etc.) and sweep/collect dry PAM material without washing with water.

PLANS AND SPECIFICATIONS

Specifications will be developed site specifically for each application. Specifications for this practice will be prepared for each field or treatment unit according to the criteria, considerations, and operation and maintenance described in this standard. Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

An Operation and Maintenance Plan must be prepared for use by the landowner or operator responsible for PAM application. The plan should provide specific instructions for PAM applications to insure it is used properly. Plan items may consist of:

- Reapply PAM to disturbed or tilled areas, including high traffic use areas.
- Monitoring advance phases of the irrigation to assure applications are discontinued when runoff begins.
- Equipment is operated and maintained to provide uniform application rates.
- Maintenance of screens and filtering facilities.
- **Clean** PAM mixing and application equipment thoroughly **as recommended by the manufacturer for the particular PAM formulation,** to avoid formation of PAM residues.
- PAM is a flocculating agent that may cause deposition in downstream watercourses or other locations when it comes in contact with sediment-laden waters. Downstream deposition from the use of PAM may require periodic cleaning to maintain normal functions.

REFERENCES

The following references may provide useful guidance and information in the development and application of polyacrylamide (PAM) for erosion control:

National Engineering Handbook, Part 652, Irrigation Guide.
National Engineering Handbooks, Part 623, Section 15, Chapter 5.

Managing Irrigation–Induced Erosion and Infiltration with Polyacrylamide. Proceedings from the conference held at the College of Southern Idaho, May 6–8, 1996. University of Idaho, Miscellaneous Publication No. 101-96.

ARS WEB site on PAM at Kimberly, Idaho. *http://kimberly.ars.usda.gov.*